
BREAKTHROUGHS IN
BIOHEALTH
CONVERGE IN WISCONSIN.®
THINK•MAKE•HAPPEN
in WISCONSIN

WHY BIOHEALTH COMPANIES CHOOSE WISCONSIN

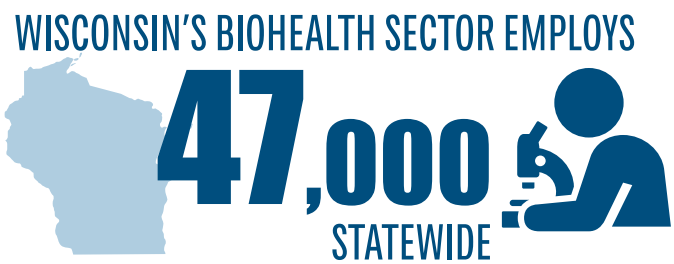
Companies looking to start, expand or relocate their operations in Wisconsin benefit from the state's central location, reliable infrastructure, talented workforce and business-friendly policies—all of which create competitive advantages that help businesses capitalize upon regional, national and global market opportunities.

Wisconsin's long history of innovation continues to fuel new solutions to challenges facing people, companies, nations and our very planet, with some of the most respected companies in the world drawing upon Wisconsin's plentiful natural resources, its renowned research capabilities and the can-do spirit of its citizens to grow and succeed.

TALENT

Wisconsin is well known for its industrious, Midwestern work ethic, and its educational system is universally admired. Wisconsin's high school graduation rate is consistently ranked among the top in the nation, and the University of Wisconsin System is regularly cited as a leader in terms of size and quality.

Wisconsin's public and private colleges support the resources, companies and policy makers throughout the state that are working to develop new, innovative products to fulfill market needs. And as the first state in the nation to develop a technical college system, Wisconsin has more than 100 years' experience training its workforce to fulfill ever-changing industry demands.



Source: EMSI Q3 2019 dataset, class of worker category, QCEW Employees 2017 Employment and Infogroup

In the field of biohealth, distinct subsectors including medical device manufacturing, bioscience, digital health, diagnostics and biopharmaceuticals are converging into a single interconnected, synergistic field to create the best solutions to today's health challenges.

Wisconsin's historical strength in bioscience, manufacturing and technology ideally positions the state to take advantage of this convergence, and to lead the way in producing the integrated health solutions of tomorrow.

BY THE NUMBERS

Wisconsin's biohealth sector is responsible for more than 47,000[1] jobs statewide, not including academic research institution and health systems jobs. Wisconsin's research universities are especially focused on bioscience relative to other fields, with $914 million in bioscience academic research and development in 2016, accounting for more than two-thirds of all academic research at these institutions, compared with 61% for the national average.[2] Wisconsin is home to more than 1,800 biohealth companies in all.[3]

1 EMSI Q3 2019 dataset, class of worker category, QCEW Employees 2017 Employment and Infogroup

2 "Investment, Innovation and Job Creation in a Growing U.S. Bioscience Industry," TEConomy/BIO 2018

3 Infogroup 2019

UNIQUE INDUSTRY ADVANTAGES

Wisconsin's strength in biohealth is unique in that it spans four major subsectors:

- **Medical devices and diagnostics.** Wisconsin is home to a large number of medical imaging companies and groundbreaking medical imaging research. This subsector constitutes one of the state's chief export categories, including a wide variety of medical equipment—everything from MRI and dialysis machines to pacemakers and vacuum devices for negative pressure wound therapy, as well as diagnostic equipment, supplies and kits.

- **Biotechnology and biopharmaceuticals.** From the development of drugs and therapies to translational and integrated science, Wisconsin has a long standing history of excellence in biotechnology and biopharmaceuticals. Wisconsin continues to demonstrate its strength in this sector with its flourishing hub for biomanufacturing and clinical trials, with over 2,000 active clinical trials for new medicines in collaboration with the state's clinical research centers, university medical schools and hospitals. [4]

- **Digital health.** Innovations at the intersection of software and health solutions are empowering patients and health care systems to provide personalized care, improve quality and reduce costs. This is Wisconsin's fastest-growing biohealth segment.

- **Health research institutes.** Wisconsin boasts some of the nation's top research institutes. Federal grants alone contribute over $1 billion in funding to Wisconsin's economy each year [5], with the National Institutes of Health supporting more than 900 grants in 2016 alone.[6] On its own, the University of Wisconsin System contributed more than 9,100 academic research and development projects in 2016.[7]

Wisconsin is also a world leader in animal genetics, with companies such as ABS Global, Accelerated Genetics and Alta Genetics.

4 phrma.org "Research in Wisconsin" report, 2017
5 2015 Wisconsin Bioscience Economic Development Report, Ernst & Young and BioForward
6 NIH State Funding Facts for Wisconsin, 2016
7 UW System: wisconsin.edu/economic-development/download/EconDevInfoGraphic-FINAL.pdf

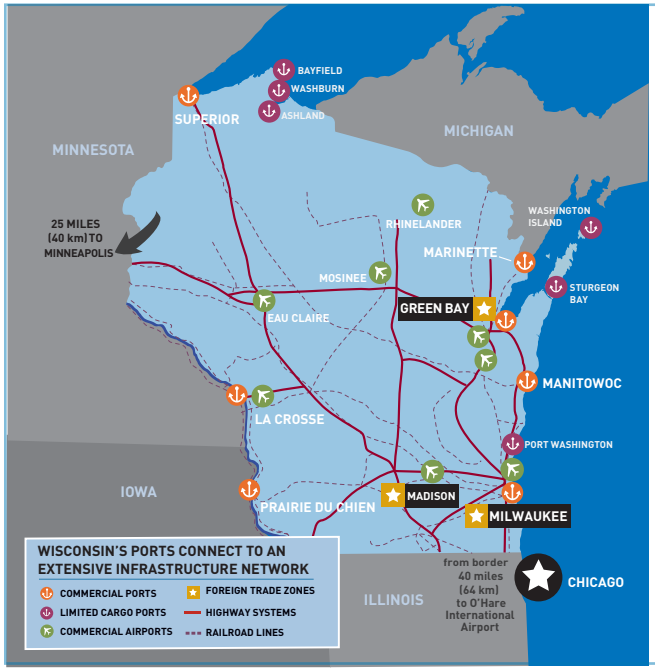
IN GOOD COMPANY

Wisconsin's vibrant biohealth sector includes companies such as:

- Exact Sciences
- GE Healthcare
- Phillips-Medisize
- Lucigen
- Promega
- Covance
- PPD
- Thermo Fisher Scientific
- Epicentre-Illumina
- Epic Systems
- Catalent Pharma Solutions
- Gilson Inc.
- MilliporeSigma

INFRASTRUCTURE

Wisconsin's central location and robust infrastructure give companies operating in the state one-day access to major markets throughout the U.S. and beyond. Wisconsin's roads, railways and ports provide seamless, convenient access to the world's busiest multimodal transportation hub, located just 55 miles south of the state's border.



INFRASTRUCTURE IN WISCONSIN

09

HIGHWAY SYSTEMS

State commerce and industry relies on nine major highways covering more than 11,700 miles (18,829 km) to move our goods to market. Our interstate system connects us to major industrial cities across the U.S.

13

RAILROAD LINES

Rail traffic throughout the state continues to grow and move more than $160 billion in freight each year, creating a seamless link in the nationwide intermodal system. Amtrak travels between Chicago and Milwaukee multiple times daily.

08

COMMERCIAL AIRPORTS

Eight commercial airport locations serving major industrial and metropolitan areas statewide. These airports are served by all major carriers, linking to every point in the nation within one business day. In addition, these larger airports are within driving distance:

CHICAGO: O'Hare is American's second largest hub, with 1068 domestic flights daily to 153 U.S. cities and more than 123 direct flights daily to 55 international destination

MINNEAPOLIS: 163 nonstop flights including 136 domestic and 27 international markets.

13

COMMERCIAL PORTS

Uniquely situated on the nation's greatest waterways, Wisconsin ships approximately 30 million tons of product from commercial cargo ports and 6 limited cargo ports located along Lake Michigan, Lake Superior and the Mississippi River.

03

FOREIGN TRADE ZONES

Companies located in one of our three Foreign Trade Zones (FTZs) can import merchandise (by truck, rail, air or boat) without going through formal customs entry procedures or paying import duties. These companies have the option to pay tariffs after their product inventory is sold, improving cash flow and saving money. Other benefits include, but are not limited to: global market competitiveness, minimized bureaucratic regulations, and improved supply chain efficiencies.

A PROUD LEGACY OF RESEARCH AND INNOVATION

The solutions emerging from Wisconsin's biohealth ecosystem are rooted in a long history of scientific discovery and innovation. Early in the 20th century, vitamins A and B were discovered at the University of Wisconsin-Madison, as was a method for enriching food with vitamin D to treat conditions including psoriasis and osteoporosis. Among many other transformative discoveries, the university-affiliated Wisconsin Alumni Research Association (WARF) holds the patent for the anticoagulant drug warfarin (named after the foundation, and sometimes sold under the brand name Coumadin®) taken by millions of Americans to lower their stroke risk.

It was at the Medical College of Wisconsin (MCW) that Lyme disease and its treatment options were first identified; it was also here that the first rapid, accurate test for lead poisoning was developed. More recently at MCW, researchers developed the functional magnetic resonance imaging (fMRI) technique for dynamic brain imaging that allows for real-time observation of changes in function and blood flow.

In 1998, one of the major milestones in the history of science took place at UW-Madison: developmental biologist James Thomson became the first in the world to isolate human embryonic stem cells and keep them alive indefinitely in culture. A decade later, Thomson's lab (concurrently with researchers in Japan) would develop a method for reverse engineering stem cells from human skin cells, thus avoiding the ethical considerations and debates involved with using cells from embryos. These "induced pluripotent stem cells" can be used to generate virtually all human cell types, with potential uses in regenerative medicine, drug screening and biomedical research.

Because of Thomson's discovery, WARF established WiCell, a 501(c)3 that has become the global leader in cell banking, characterization testing and distribution of stem cell lines. From 2015 to 2018, its catalog grew from 75 cell lines to more than 1,200.[8] The WiCell Stem Cell Bank includes cell lines submitted by researchers around the globe. WiCell's characterization laboratory offers several types of genetic testing, and WiCell's core laboratory offers product screening and quality control testing using human pluripotent stem cells.

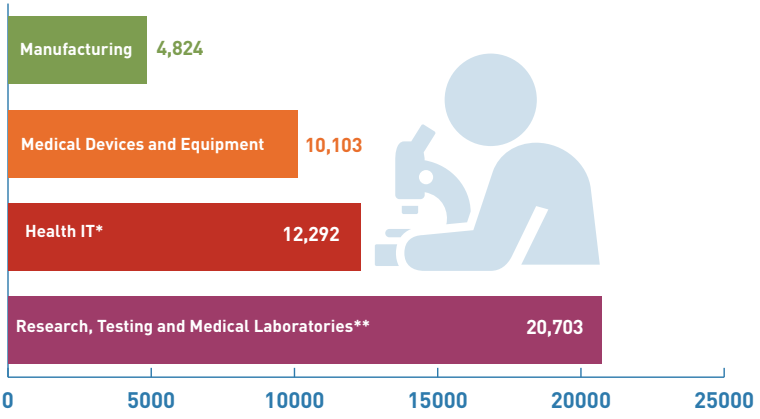
Wisconsin is also home to a power player in the health technology space: Epic Systems. The market leader in electronic health records, with more than 250 million patients[9] served by its record systems, is based in Verona, just outside Madison.

The location of this strong industry leadership in Wisconsin has led to a critical mass of small and midsize companies in related fields also deciding to locate here.

8 "After 20 years, stem cells mean business in Wisconsin," UW-Madison News Office, Nov. 15, 2018

9 Epic Systems website, 2019

BIOHEALTH JOBS IN WISCONSIN



*Infogroup employment numbers based on 84 selected companies
**Includes employee counts from EMSI and Infogroup

Source: EMSI Q1 2019 Dataset class of worker category, QCEW Employees 2017 Employment

HOWEVER YOU DEFINE MANUFACTURING, WISCONSIN EXCELS

We build things in Wisconsin, and we're good at it. Wisconsin established its manufacturing excellence in the industrial age, and its leadership continues today. Wisconsin manufacturers benefit from an integrated, versatile and responsive supply chain that supports a diverse biohealth industry. All phases of manufacturing, from prototyping to sourcing components and ingredients, all the way to the final packaging, can be completed right here in Wisconsin.

Within the sphere of manufacturing, Wisconsin excels in the manufacturing of diagnostics, molecules, cells and tissues—a field known as biomanufacturing that is emerging as a substantial industry in the U.S. and globally. Active pharmaceutical ingredient (API) manufacturers such as Scientific Protein Labs, Alcami, MilliporeSigma and Catalent manufacture the molecules and compounds needed for discovering and testing new drugs, as well as molecules whose efficacy is well established. For example, Waunakee-based Scientific Protein Labs is among the largest commercial suppliers of heparin sodium, a widely used anticoagulant administered to treat and prevent blood clots. Ongoing stem cell research at UW-Madison and its affiliated institutes has led to a concentration of companies that seek to use these cells therapeutically and commercialize those therapies.

Madison's inordinately large life science industry relative to its size, and its proximity to medical device and pharmaceutical hubs such as Minneapolis, Chicago and Indianapolis have made it a Midwest epicenter for biomanufacturing innovation. In addition, Wisconsin has a robust medical device manufacturing industry in its own right: Wisconsin exported $3 billion worth of medical and scientific instruments in 2018,[10] making it the state's third-largest export category, and 131 medical device manufacturers are based in Wisconsin.[11]

In particular, Wisconsin ranks #1 in the nation for employment concentration and overall employment for irradiation apparatus manufacturing. This industry employs more than 4,000 people in Wisconsin—a greater number than are employed in this industry in California, Florida and Texas combined.[12]

[10] U.S. Census Bureau Foreign Trade Division data via WISERTrade, 2018

[11] Infogroup

[12] Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Annual 2017 Employment

GLOBAL LEADERSHIP

Biohealth products made in Wisconsin are helping improve people's health around the world, with 42% of all U.S. computed tomography apparatus exports coming from Wisconsin. Wisconsin also leads the U.S. in the export of heparin preparations and cultures (24% of U.S. exports).[13]

Due to Wisconsin's strength in multiple subsectors of biohealth, the state has become an attractive destination for foreign direct investment (FDI) and acquisition targets from multinational corporations. Wisconsin has many examples of startups that have grown into thriving companies before being purchased by global companies that wish to integrate the Wisconsin companies technology into their offerings.

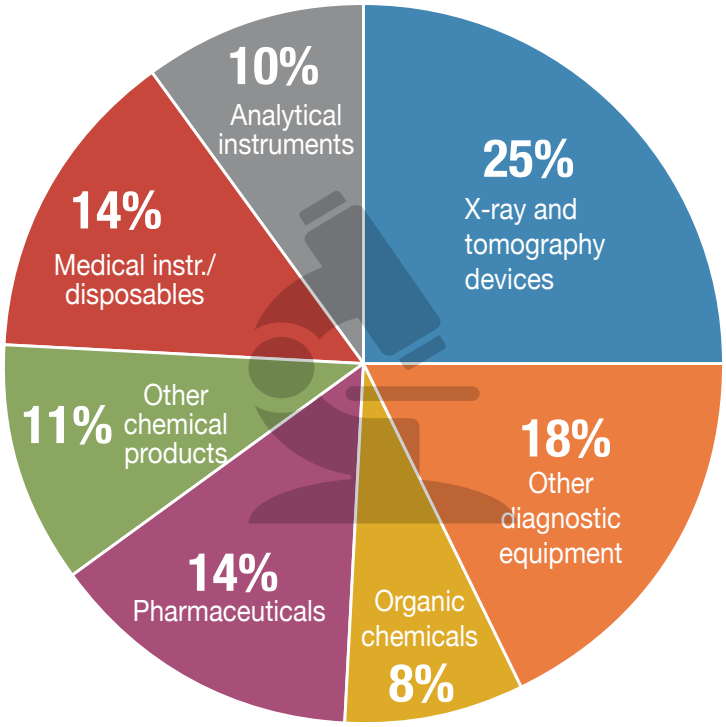
An example of such an investment was the sale of Milwaukee-based Marquette Electronics to GE Healthcare in 1998 for $808 million. At the time, the company was known as GE Medical Systems and was already the world's leading manufacturer of equipment for MRI and CT scans; the acquisition added heart monitoring machines to GE's product line.

Wisconsin's unique biohealth manufacturing capabilities recently drew Fujifilm (of Japan) to acquire Madison-based Cellular Dynamics International. Similarly, British company LGC acquired Middleton-based Lucigen in 2018. Also in 2018, Madison-based Semba Biosciences received a $3 million investment from the Japanese conglomerate Tosoh Bioscience—an investment that is expected to lead to Tosoh's eventual purchase of Semba. And in 2019, Medtronic (the world's largest medical device company, now headquartered in Ireland) announced plans to acquire Titan Spine, a Mequon-based maker of titanium interbody fusion devices featuring a surface technology that encourages the growth of bone into surgical implants.

Other examples of acquisitions of Wisconsin biohealth companies include:

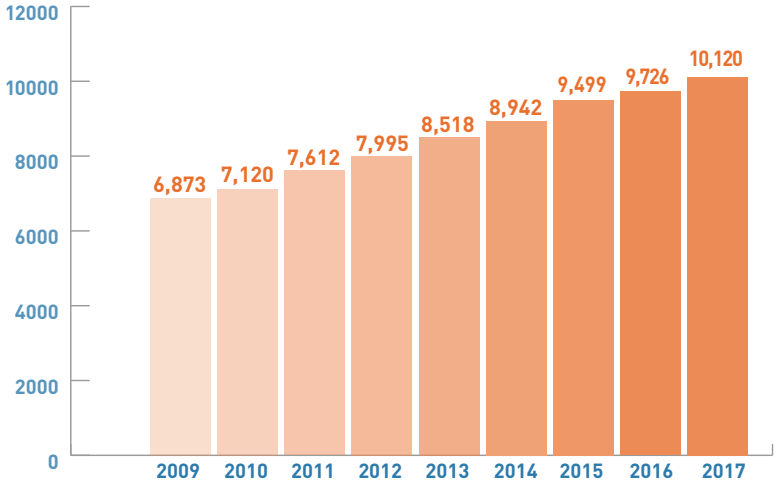
- **Epicentre** (Illumina)
- **MilliporeSigma** (Merck KGaA)
- **Neuwave Medical** (J&J)
- **Propeller Health** (ResMed)
- **Scientific Protein Laboratories** (Hepalink)
- **Stratatech** (Mallinckrodt Pharmaceuticals)

WISCONSIN'S BIOHEALTH EXPORTS



Source: U.S. Census Bureau Foreign Trade Division Data via WISERTrade, 2018

UW SYSTEM STEM DEGREES AWARDED



Source: NCES IPEDS Database

[13] U.S. Census Bureau Foreign Trade Division data via WISERTrade, 2018

CUTTING-EDGE ACADEMIC PROGRAMS AND INDUSTRY-ACADEMIC COLLABORATIONS

Biohealth companies in Wisconsin benefit from a vast array of assets and resources that exist to support the industry, above and beyond the fellowship that comes with a critical mass of companies doing related work.

The **UNIVERSITY OF WISCONSIN-MADISON** is an academic heavy-weight, with more than 40,000 students and an annual budget of nearly $3 billion. Founded in 1848, the university ranks in the top 10 for research spending nationally, and has for many years. It is home to more than 100 research centers, many of them in the biological and health sciences, and the university-affiliated WARF holds patents for more than 1,700 technologies.

$1.2 BILLION UW-MADISON INVESTS ANNUALLY IN RESEARCH AND DEVELOPMENT

Source: UW-Madison 2018-19 Budget in Brief

Founded in 1907, UW-Madison's **SCHOOL OF MEDICINE AND PUBLIC HEALTH** (SMPH) is recognized across the state, nation and world as a leader in education, research and service. The school was the nation's first to fully integrate medicine and public health—a revolutionary synthesis that seeks to develop new approaches for not just diagnosing and treating but also preventing illness, focusing simultaneously at the level of the individual and of entire populations. The school has a long tradition of rapidly translating discovery into application.

The **MEDICAL COLLEGE OF WISCONSIN** (MCW) is a distinguished leader and innovator in the education and development of the next generation of physicians, scientists, pharmacists and health professionals. Its mission includes discovering and translating new knowledge in the biomedical and health sciences; providing cutting-edge, collaborative patient care of the highest quality; and improving the health of the communities it serves. The school invests more than $225 million in research each year, making it the second-largest research institution in Wisconsin. Among many other excellent programs, its newly launched school of pharmacy has the only three-year pharmacy program in the Midwest located at an academic medical center. The school also collaborates with Marquette University in a combined Department of Biomedical Engineering, allowing the department to draw on the strengths of both institutions.

As Wisconsin's only public urban research university, the **UNIVERSITY OF WISCONSIN-MILWAUKEE** (UWM) has established an international reputation for excellence in research, community engagement, teaching and entrepreneurship. UWM has a student population of 26,000 and is an engine for innovation in southeastern Wisconsin. UWM proudly excels at serving a diverse student base—fully one-third are students of color, and more veterans attend UWM than any other school in Wisconsin. Due in large part to the efforts of the UWM Department of Chemistry, southeastern Wisconsin is considered a center of excellence for applied chemistry.

IN 2017, **WISCONSIN'S** COLLEGES AND UNIVERSITIES AWARDED MORE THAN

4,500 DEGREES

IN ENGINEERING AND ENGINEERING TECHNOLOGY FIELDS, INCLUDING CERTIFICATES, ASSOCIATE, BACHELOR'S AND ADVANCED DEGREES.

Source: National IPEDS database published by the U.S. Department of Education's NCES

AdvocateAuroraHealth

Advocate Health Care and Aurora Health Care formally merged in 2018 to create Advocate Aurora Health, the 10th largest not-for-profit, integrated health care system in the United States, serving nearly three million patients each year. The two organizations, known for their track record on clinical quality and outcomes, cited enhanced scale, expanded access, greater efficiencies and a shared commitment to transform the care delivery model as key drivers for the merger.

Marshfield Clinic

MARSHFIELD CLINIC, one of only a few large, independent nonprofit medical clinics in the U.S., is the largest private group medical practice in Wisconsin and one of the largest in the U.S., with more than 1,200 providers and more than 10,000 additional employees. Its affiliated research institute has more than 800 active research projects at any given time. Researchers have access to a CDC-certified biosafety level 3 lab that performs more than 14,000 lab tests every year, a dedicated Clinical Research Unit to conduct trials, and an integrated medical and dental electronic health record containing coded diagnosies data back to 1960, with other coded data and digital documents back to the mid-1980s. Located in north central Wisconsin, Marshfield Clinic is one example of biohealth strength that spans the entire state, even beyond its major cities.

WiNHR UW ICTR
Wisconsin Network for Health Research
UW Institute for Clinical and Translational Research

The **WISCONSIN NETWORK FOR HEALTH RESEARCH** is a partnership among UW-Madison SMPH, the Marshfield Clinic Research Institute, Aurora Health Care and Gunderson Health System. Established in 2005, the network provides researchers with statewide reach and a diverse patient population, with potential access to more than 5 million patients. The network was established to promote statewide research and to assist in moving research results from bench to bedside by allowing investigators to perform clinical, translational, comparative effectiveness and health outcomes research across a variety of platforms.

BUILDING A BETTER WORKFORCE

MADISON AREA | TECHNICAL COLLEGE

MADISON COLLEGE is contributing to this sector's growing workforce demands by offering a post-baccalaureate certificate in biotechnology. The college was also awarded a grant from the National Science Foundation to work collaboratively with City College of San Francisco to bring stem cell education into technical colleges, as well as middle and high schools, nationwide.

Many other institutions across Wisconsin—including **MILWAUKEE AREA TECHNICAL COLLEGE** and **WAUKESHA COUNTY TECHNICAL COLLEGE**—are educating the workforce of the future in health care, research and other biohealth careers. Notably, the **CONCORDIA UNIVERSITY WISCONSIN SCHOOL OF PHARMACY** offers a master's degree in product development—a unique program that was designed in close collaboration with private sector partners.

BioPharmaceutical Technology Center INSTITUTE

Founded in 1993, the **BIOPHARMACEUTICAL TECHNOLOGY CENTER INSTITUTE** exists to offer training in biotechnology and biopharmaceutical manufacturing; promote the exchange of information among industry, educators and the general public; support the development of high-tech industries; facilitate science, technology, nature discovery and arts programs for children and young adults; encourage greater understanding of the creative process; and enable community organizations to offer educational and cultural programs.

UW Institute for Clinical and Translational Research
UW ICTR

Clinical & Translational Science Institute

Wisconsin has two translational research centers with funding from the National Institutes of Health: the **UW-MADISON INSTITUTE FOR CLINICAL AND TRANSLATIONAL RESEARCH** at the **MCW CLINICAL AND TRANSLATIONAL SCIENCE INSTITUTE** (CTSI). CTSI is a consortium of eight Milwaukee area institutions dedicated to transforming biomedical research:

- Marquette University
- Milwaukee School of Engineering
- University of Wisconsin-Milwaukee
- Medical College of Wisconsin
- Froedtert Health
- Children's Hospital of Wisconsin
- The Milwaukee Veterans' Administration
- Versiti

CTSI's research portfolio currently supports more than 1,000 researchers and more than 200 clinical trials.

UWM RESEARCH FOUNDATION

The **UWM RESEARCH FOUNDATION** supports research and innovation through scholarship and grant funding, and through the facilitation of university-corporate partnerships.

WARF
Wisconsin Alumni Research Foundation

With a vision of enabling UW-Madison research to solve the world's problems, the **WISCONSIN ALUMNI RESEARCH FOUNDATION** (WARF) supports scientific research within the UW-Madison community by providing financial support, actively managing assets, and moving innovations to the marketplace for a financial return and global impact. WARF invests in the university by partnering with UW-Madison to steward the cycle of research, discovery, commercialization and investment. Founded in 1925 by visionary alumni, WARF is among the oldest and most successful technology transfer offices in the nation. As the designated patent and licensing organization for UW-Madison, WARF advances transformative discoveries to the marketplace to benefit humankind across Wisconsin and the world.

In addition, **TECHNOLOGY TRANSFER OFFICES** at the Wisconsin System Technology Foundation, Medical College of Wisconsin, Marquette University and Versiti provide assistance for researchers and inventors to commercialize their discoveries, helping to ensure that scientific breakthroughs reach their potential to save and enhance lives.

Established in 1984, the UW-Madison-affiliated **UNIVERSITY RESEARCH PARK** is an internationally recognized research and technology park that supports early-stage and growth-oriented businesses in a wide range of sectors, including engineering, computational and life sciences. The research park spans 255 acres and is home to more than 125 companies that together employ about 3,800 workers. Above and beyond the role of an average office park, the research park supports programs and events that leverage the university's strengths and contribute to the local technology ecosystem.

Madison Gas & Electric Innovation Center

Within the research park, the **MADISON GAS & ELECTRIC INNOVATION CENTER** serves as a technology incubator, offering unique opportunities and incentives for startups in a specialized growth environment. Since 1989, more than 70 early-stage companies have taken advantage of the office and laboratory space, benefiting from the center's top-flight equipment, amenities and community.

Milwaukee's **TECHNOLOGY INNOVATION CENTER AT RESEARCH PARK** is a community of constant innovation, where ideas flow out of laboratories and into the marketplace and where entrepreneurs drive the innovations that move us all ahead. The Technology Innovation Center provides its exceptional community of entrepreneurs with the environment, support and resources they need—not just to grow, but to thrive.

The **UW-MADISON BIOTECHNOLOGY CENTER** offers state-of-the-art research services with competitive user fees. Services offered include DNA synthesis and sequencing, peptide synthesis, peptide sequencing and mass spectrometry of phosphopeptides and small metabolites, production of transgenic/knockout mice and rats, education programs and multimedia technology resources.

The **MORGRIDGE INSTITUTE FOR RESEARCH** is an independent biomedical institute exploring uncharted scientific territory to discover tomorrow's cures. Using mechanisms unique to a private institute, it helps UW-Madison recruit top scientific talent, build powerful research collaborations and provide shared resources to bolster university science. Its research focus areas include bioethics, core computation, medical engineering, metabolism, regenerative biology and virology.

Center for Predictive Computational Phenotyping

UW-Madison's **CENTER FOR PREDICTIVE COMPUTATIONAL PHENOTYPING** is developing innovative computational and statistical methods and software for a broad range of problems that can be cast as computational phenotyping. The center investigates how to exploit a wide array of data types for these tasks, including molecular profiles, medical images, electronic health records and population-level data. The center also provides training in biomedical "big data" analysis to scientists and clinicians, and is investigating the bioethical issues surrounding the development of this technology.

UWM's **INSTITUTE FOR DRUG DISCOVERY** was established to advance research and later-stage development of new drugs from research at the university and its collaborating institutions in areas including neuroscience, cancer and infectious diseases. Its capabilities include organic compound synthesis, medicinal chemistry and drug design, metallo-chemistry, drug compound SAR, diversity synthesis, analytical chemistry, enzymology, natural products chemistry, cell-based assay development, high-throughput screening, molecular biology, fermentation and protein separations, and x-ray crystallography.

Once completed, the new **ATHLETIC PERFORMANCE RESEARCH CENTER**, a partnership between Aurora and Marquette University, will serve as a central hub for research in emerging fields including exercise physiology, athletic training, biomedical engineering, nutrition and rehabilitation.

A THRIVING ECOSYSTEM FOR BIOHEALTH ENTREPRENEURSHIP

When it comes to biohealth, Wisconsin's competitive advantage stems from the existence of not only a rich ecosystem of companies and researchers, but also a highly integrated economic development network to ensure that innovations are successfully brought to market. In a recently released report, Wisconsin ranked third in the nation for securing federal Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) grants from 2008-2017, an indicator of the high volume of discoveries being commercialized in Wisconsin.[14]

The **I-CORPS PROGRAM**, a joint project of five Milwaukee universities with funding from the National Science Foundation, works to foster commercialization of applied academic research and faculty/student innovation, build an innovation/commercialization network that supports faculty and/or student ventures, and broaden the pool of students and faculty fluent in Lean LaunchPad methodology.

The **WEINERT CENTER FOR ENTREPRENEURSHIP** at the Wisconsin School of Business aims to improve society and the lives of the school's students with a focus on launching entrepreneurial ventures and helping them navigate crucial transitions; evaluating and managing the risks of funding startup and early-stage companies; understanding and influencing local, state and national public policies that facilitate successful entrepreneurship moving science and knowledge into entrepreneurial ventures; and using for-profit ventures to accomplish social goals.

UWM's **LUBAR ENTREPRENEURSHIP CENTER** is a 20,000-square-foot space for co-working and collaboration, flexible instruction, innovation labs, "maker-spaces," and touchdown and launch space for companies.

LAW AND ENTREPRENEURSHIP CLINICS at UW-Madison and Marquette University provide pro bono assistance to help entrepreneurs navigate the legal issues associated with starting their companies and commercializing their ideas.

Photo courtesy of the Biopharmaceutical Technology Center Institute

At Marquette University, students have access to the **KOHLER CENTER FOR ENTREPRENEURSHIP**, which helps them develop entrepreneurial skills through a combination of mentoring, workshops, funding opportunities and community partnerships.

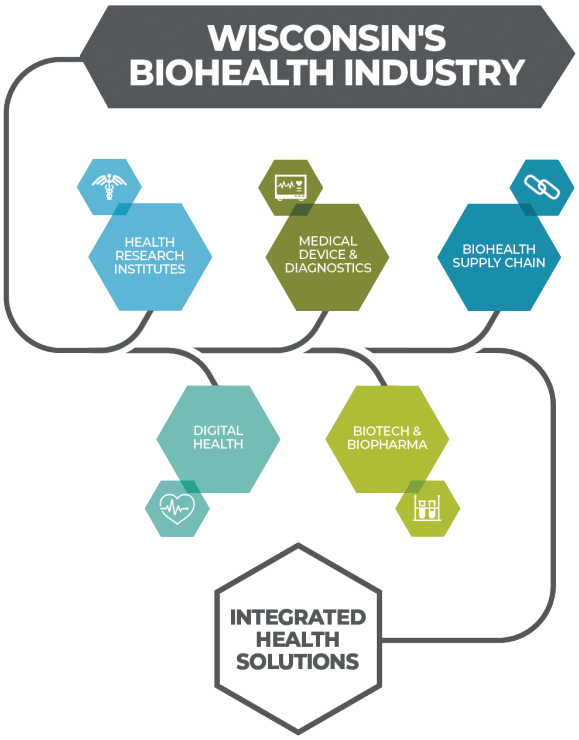
The Wisconsin Economic Development Corporation (WEDC) certifies companies as **QUALIFIED NEW BUSINESS VENTURES**, allowing them to attract investment more easily since investors can receive tax credits for the amount they invest in certified companies. WEDC also offers **TECHNOLOGY DEVELOPMENT LOANS** to help companies clear the hurdles associated with bringing new technologies, products and concepts to market.

Through its **CAPITAL CATALYST PROGRAM**, WEDC makes seed grants available to highly structured and well-funded organizations that are dedicated to stimulating entrepreneurship—including, notably, **Bridge to Cures**, a Milwaukee-based organization that focuses on innovations with the potential to address unmet medical needs.

Through UW-Extension's **CENTER FOR TECHNOLOGY COMMERCIALIZATION**, WEDC also supports Entrepreneurial Micro-grants that can be used to obtain the services of a qualified provider for the purpose of developing an application for a federal SBIR/STTR grant, as well as matching grants for SBIR/STTR funding to cover costs that are not covered by the federal grants.

[14] State Science & Technology Institute, 2019

BOOSTING THE BIOHEALTH SECTOR



BioForward WISCONSIN

The Forward BIO Initiative was established as a biomanufacturing center of excellence. A collaborative effort that aims to offer entrepreneurs and researchers the resources needed to effectively translate discoveries into commercial products, the initiative focuses on the advanced manufacturing of therapeutic medical devices, cells, tissues or pharmaceuticals. The initiative is committed to advancing Wisconsin's position as a national leader in biomanufacturing, and consists of three components:

BioForward Wisconsin facilitates partnerships between government, academic and private industry, as well as marketing the economic impact of local biomanufacturing companies and Wisconsin's biohealth industry. The organization connects industry partners to the Forward BIO Institute and Forward BIOLABS to ensure corporate engagement with entrepreneurs.

A NATIONAL HUB FOR BIOMANUFACTURING

FORWARD BIO INSTITUTE

The **Forward BIO Institute**, based at the University of Wisconsin-Madison, will support transformative research in this emerging field, translate biomanufacturing technologies into the private sector, and establish public-private partnerships to connect UW inventors and researchers with industry leaders. The institute will also serve as a feeder of startups by providing a workforce skilled in both biomanufacturing and relevant business concepts. As part of this initiative, the institute is establishing a new master's degree at UW-Madison in biomanufacturing innovation.

Forward BIOLABS

Forward BIOLABS is a new, nonprofit shared laboratory facility that provides fully supported lab and office space. The availability of this shared space frees up capital for startups as they are no longer required to spend their limited resources on leasing space, purchasing equipment and setting up a lab. The 8,700-square-foot facility is located at University Research Park in Madison, with lab space for up to 20 scientists and common co-working space to allow members to collaborate.

WISCONSIN BIOHEALTH COMPANIES

GE HEALTHCARE

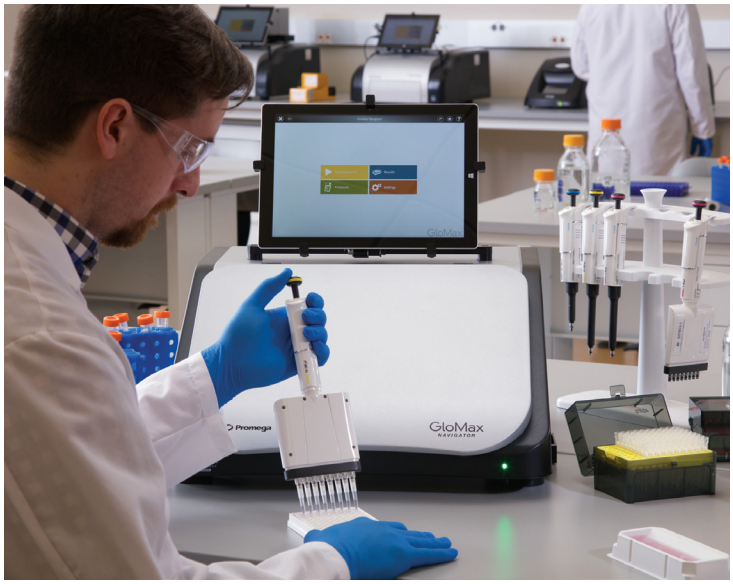
Waukesha, Wauwatosa, Milwaukee,
West Milwaukee, Oak Creek, Madison, Pewaukee

GE Healthcare is a $17 billion unit of General Electric Co., employing more than 48,000 people worldwide and serving health care professionals in more than 160 countries. The company's imaging and clinical care practices, which include ultrasound, magnetic resonance imaging (MRI), computed tomography (CT), patient monitoring, maternal/infant care and X-Ray technologies, are headquartered in Wisconsin, where the largest concentration of GE Healthcare's workforce—6,000 employees—is located. In total, the ripple effect of GE Health–care supports more than 20,000 jobs in Wisconsin through its supply chain participants in the state.

GE Healthcare's Wisconsin employees have collectively earned nearly 3,000 engineering degrees, many from Wisconsin institutions that work collaboratively with the state's businesses to ensure that the skills taught match industry needs. To meet the rising demand for science, technology, engineering and mathematics (STEM) graduates, Wisconsin has steadily increased the number of degree holders in these fields, with significant growth in programs not only at the University of Wisconsin-Madison and other UW System schools, but also in the state's technical colleges. The growth rate for Wisconsin's pool of graduates is especially high in computer and information sciences and support services, a positive trend for GE Healthcare as it pursues digital health solutions.

PROMEGA

Fitchburg



With a portfolio of more than 4,000 products covering the fields of genomics, protein analysis, cellular analysis, drug discovery and genetic identity, Promega is a global leader in providing innovative solutions and technical support to life scientists in academic, industrial and government settings.

Promega products are used by life scientists who are asking fundamental questions about biological processes, as well as by researchers who are applying scientific knowledge to diagnose and treat diseases, discover new therapeutics, and use genetics and DNA testing for human identification. The company holds significant intellectual property rights and licenses in several key areas that form a foundation for its diverse portfolio, including bioluminescence (engineered luciferases, luciferase reporter vectors and luciferase substrates); short tandem repeat (STR) detection for cell line authentication; human identification; cell and tissue characterization; and mixed sample detection. The Promega HiBit Protein Tagging System provides tools for the study of endogenous biology with increasing application, including roles in gene editing as well as unraveling the mechanisms of how proteins function and how they are degraded.

Founded in 1978 in Fitchburg and still headquartered there, Promega has branches in 16 countries, and has more than 50 global distributors serving 100 countries. A cornerstone of Promega business practice is supporting customers, community and employees.

WISCONSIN

EXACT SCIENCES
Madison

Exact Sciences relocated from Boston to Madison because its two-man operation wanted to tap into the state's strong, dedicated workforce and first-class universities for talent recruitment. Committed to playing a role in the eradication of colorectal cancer, the company wanted the best and brightest to help further its mission. However, after developing the noninvasive stool DNA-based colorectal cancer screening test for average-risk adults age 50 or older, gaining approval from the U.S. Food and Drug Administration, and receiving a national coverage decision from the Centers for Medicare and Medicaid Services, the company needed assistance in order to grow.

With the molecular diagnostics company increasing to a workforce of more than 1,800 employees and the industry's growing interest in the company's easy-to-use colorectal cancer screening, Exact Sciences turned to WEDC to help fulfill its desire to remain and grow in Wisconsin, and received an incentive package of tax credits the company could earn by fulfilling its growth plans.

Because of the expansion, Exact Sciences has new main offices and a research and development lab. With support from WEDC, the company, which is now publicly traded, has grown to more than 1,900 employees nationwide, nearly 1,500 of whom are based in south central Wisconsin. Approximately 147,000 health care providers have ordered its colorectal cancer screening test, Cologuard®, and Exact Sciences is in the early stages of developing tests to screen for other types of cancer.

ALCAMI
Germantown

Alcami is a leading, fully integrated, end-to-end contract development and manufacturing organization headquartered in Durham, North Carolina. With more than 900 employees operating at 10 locations worldwide, Alcami helps biologics and pharmaceutical companies of all sizes navigate the complex road of delivering breakthrough therapies to patients faster, from concept to commercialization.

Alcami connects its global clients with customizable and innovative solutions for active pharmaceutical ingredient (API) development and manufacturing, solid state chemistry, formulation development, analytical development and testing services, clinical and commercial finished dosage form manufacturing (oral solid dose and parenteral), packaging and stability services.

Alcami's Center of Excellence for API development, scale-up, and commercialization in Germantown, Wisconsin, originated in 1999 as a chemistry outsourcer, Cambridge Major Laboratories. The company's modern campus opened in 2004 with four chemistry development laboratories, cGMP quality control laboratories, five kilo laboratories, two mini plants and two pilot plants. Full capacity was quickly reached, and a second facility was constructed in 2008, doubling the development space while increasing cGMP manufacturing space sevenfold. In 2013, $15 million was invested in expanding commercial manufacturing operations, and an administrative building was purchased to support staffing increases. Since then, the site has further advanced its capabilities to include controlled substances manufacturing and dedicated highly potent API manufacturing suites.

BIOHEALTH COMPANIES

LUCIGEN CORP.

Middleton

Founded in Wisconsin in 1998, Lucigen offers products and services that enable life-science professionals to perform their research and testing more efficiently and effectively. The company has grown to manufacture and sell more than 325 biomedical research products and services to customers worldwide. Core competencies include enzyme evolution, protein expression, cloning, competent cells, next-generation sequencing and molecular diagnostics.

In 2018, Lucigen was acquired by LGC, a global life sciences firm based in the UK. Lucigen is now part of Biosearch Technologies, the complete genomics portfolio from LGC, which provides products and services for genomic analysis that support mission-critical applications for global customers in agrigenomics and molecular diagnostics. Its combined portfolio now offers workflow solutions for DNA sample preparation and downstream processing, as well as an expanded range of high-quality PCR reagents, custom genotyping assays, genomic services, gene editing and all the NGS services Lucigen's customers expect from the company.

The Lucigen portfolio includes custom and bulk enzymes and buffers as critical components for molecular diagnostics. Sales offices are located in China, Germany, Singapore, the UK, and the U.S. Sales representatives are available throughout Europe, Latin America and the Asia/Pacific region, with distributors in other key territories.

PHILLIPS-MEDISIZE

Eau Claire, Hudson, New Richmond, Menomonie, Medford, Phillips

Phillips-Medisize LLC, a Molex company, is a leading global outsource provider of design and manufacturing services to the drug delivery, consumable diagnostics, medical device and specialty commercial markets. With unparalleled experience in advanced molding and assembly, Phillips-Medisize has become a dominant force in the medical device and diagnostics, drug delivery, primary pharmaceutical packaging and commercial markets. Backed by the combined global resources of Molex and its parent company, Koch Industries, Phillips-Medisize's core advantage to customers is the knowledge of its people to integrate design, molding and automation, providing innovative, high-quality manufacturing solutions.

Phillips-Medisize provides end-to-end services from concept to commercialization. The company partners with its customers to provide design and development services that accelerate speed-to-market of innovative products, and works with customers to deploy advanced automated assembly and quality control technologies that reduce manufacturing cost while improving quality.

Phillips-Medisize is headquartered in Hudson, Wisconsin, and employs more than 5,500 people in 26 locations throughout the U.S., Mexico, Europe and Asia. Over 2,000 of these employees are in Wisconsin. Company executives say Wisconsin's skilled workforce and friendly business climate have helped Phillips-Medisize succeed on a global scale.

The Wisconsin Economic Development Corporation (WEDC) leads economic development efforts for the state by advancing and maximizing opportunities in Wisconsin for businesses, communities and people to thrive in a globally competitive environment. WEDC provides resources, operational support and financial assistance to companies, partners and communities in Wisconsin. WEDC achieves its mission through initiatives driven by five strategic pillars: business development; community and economic opportunity; strategic economic competitiveness; state brand management and promotion; and operational and fiscal excellence. Working with more than 600 regional and local partners, WEDC develops and delivers solutions representative of a highly responsive and coordinated economic development network.

Visit **InWisconsin.com** to learn more.

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August 2019